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10/028,945	12/20/2001	Peter Gascoyne	UTSC:734US	3829

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EXAMINER
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NOGUEROLA, ALEXANDER STEPHAN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 07/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/028,945

Applicant(s)

GASCOYNE ET AL.

Examiner

ALEX NOGUEROLA

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 10 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-13 and 15-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-31 is/are allowed.
- 6) ☒ Claim(s) 1-13 and 15-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Status of the Objections and Rejections Applied in the Office action of December 08, 2003*

1. All previous objections and rejections are withdrawn.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-13 and 15-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention: the statutory class of invention is indefinite. Applicants have amended independent claims 1, 9, and 18 to require that the electrodes be "driven by inhomogeneous AC signals." Applicants argue that this limitation renders the relevant claims allowable (top of page 9 of the amendment). However, claims 1-13 and 15-26 were originally directed to a device. The new limitation of having the electrodes "driven by inhomogeneous AC signals" is a step of using the device ("It is clear that the cited anticipation reference does not disclose or suggest **applying** inhomogeneous AC signals ... as required by amended claims 1 and 9 [emphasis added].") See the top of page 9 of the amendment.). Thus, it is not clear

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whether claims 1-13 and 15-26 are directed to a method of using the device or just the device. If just the device, then Applicants should use “means plus function” language or some other structural claim language to include an element for driving the electrodes with inhomogeneous AC signals, since allowability allegedly hinges on this limitation.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1-3, 7, and 9 are rejected under 35 U.S.C. 102(a) as being anticipated by newly cited Jones et al. (“Dielectrophoretic liquid actuation and nanodroplet formation,” *Journal of Applied Physics*, vol. 89, no. 2, 15 January 2001, pp. 1441-1448).

Addressing claim 1, for the claim limitations see the abstract and the section entitled “IV. NANOLITER DROPLET FORMATION, which begins on page 1445.”

Addressing claims 2, 3, 10, and 11, as seen in Figures 6 and 7 the inlet fluid pathway and outlet fluid pathway each comprise a channel (flow structure).

Addressing claims 7 and 16, note from Figure 6(b) that a micropipette is in operative relation to the inlet fluid pathway for a period of time.

Addressing claim 9, for the claim limitations see the abstract and the section entitled "IV. NANOLITER DROPLET FORMATION, which begins on page 1445."

Note that a hydrophobic patch adjacent one of the electrodes "configured to inhibit fluid flow from the inlet fluid pathway to the outlet fluid pathway in the absence of electrical signals" is implied because "[w]hen the voltage is removed, the flow structure connecting the large droplet to the intermediate reservoir drains rapidly, leaving the isolated ~100 nl droplet shown in Fig. 7(c)" (second column on page 1445). Also note the water droplet as opposed to water film in Figure 5.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over newly cited Jones et al. ("Dielectrophoretic liquid actuation and nanodroplet formation," *Journal of Applied Physics*. vol. 89, no. 2, 15 January 2001, pp. 1441-1448) in view of newly cited Cheng et al. (US 6,071,394).

Addressing claim 6, Jones et al. teaches a dielectric gate comprising one or more electrodes coupled between an inlet fluid pathway and an outlet fluid pathway, the one or more electrodes configured to draw fluid from the inlet fluid pathway to the outlet fluid pathway using dielectric forces arising from electrical signals applied to the one or more electrodes. Jones et al. ("Dielectrophoretic liquid actuation and nanodroplet formation," *Journal of Applied Physics*. vol. 89, no. 2, 15 January 2001, pp. 1441-1448).

Jones et al. does not mention providing a chamber covering at least a portion of the dielectric gate.

Cheng et al. teaches a dielectrophoresis device having a chamber covering at least a portion of the dielectrophoresis electrodes (abstract and col. 8, ll. 25-35). It would have been

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obvious to one with ordinary skill in the art at the time the invention was made to provide a chamber covering as taught by Cheng et al. in the invention of Jones et al. because this will protect the fluid and flow pathways from contamination by dust or other particles in the air, which may affect the flow of the fluid and any reactions in which the fluid may be involved.

Addressing claim 15, Jones et al. teaches a dielectric gate comprising

an inlet fluid pathway;

one or more electrodes in operative relation with the inlet fluid pathway;

a hydrophobic patch adjacent at least one of the electrodes; and

an outlet fluid pathway in operative relation with at least one of the electrodes;

wherein the one or more electrodes are configured to draw fluid from the inlet fluid pathway to the outlet fluid pathway using dielectric forces arising from electrical signals applied to the one or more electrodes; and

wherein the hydrophobic patch is configured to inhibit fluid flow from the inlet fluid pathway to the outlet fluid pathway in the absence of the electrical signals. See the abstract and the section entitled "IV. NANOLITER DROPLET FORMATION, which begins on page 1445."

Note that a hydrophobic patch adjacent one of the electrodes "configured to inhibit fluid flow from the inlet fluid pathway to the outlet fluid pathway in the absence of electrical signals" is implied because "[w]hen the voltage is removed, the flow structure connecting the large droplet to the intermediate reservoir drains rapidly, leaving the isolated ~100 nl droplet shown in

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Fig. 7(c)" (second column on page 1445). Also note the water droplet as opposed to water film in Figure 5.

Jones et al. does not mention providing a chamber covering at least a portion of the dielectric gate.

Cheng et al. teaches a dielectrophoresis device having a chamber covering at least a portion of the dielectrophoresis electrodes (abstract and col. 8, ll. 25-35). It would have been obvious to one with ordinary skill in the art at the time the invention was made to provide a chamber covering as taught by Cheng et al. in the invention of Jones et al. because this will protect the fluid and flow pathways from contamination by dust or other particles in the air, which may affect the flow of the fluid and any reactions in which the fluid may be involved.

10. Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over newly cited Jones et al. ("Dielectrophoretic liquid actuation and nanodroplet formation," *Journal of Applied Physics*. vol. 89, no. 2, 15 January 2001, pp. 1441-1448) in view of the newly cited Derwent abstract of Gerisch et al. (DD 250661 A).

Addressing claim 8, Jones et al. teaches a dielectric gate comprising one or more electrodes coupled between an inlet fluid pathway and an outlet fluid pathway, the one or more electrodes configured to draw fluid from the inlet fluid pathway to the outlet fluid pathway using dielectric forces arising from electrical signals applied to the one or more electrodes. Jones et al. ("Dielectrophoretic liquid actuation and nanodroplet formation," *Journal of Applied Physics*. vol. 89, no. 2, 15 January 2001, pp. 1441-1448). Jones et al. also teaches a micropipette in operative relation to the inlet fluid pathway for a period of time (Figure 6 (b)).

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Jones et al. does not mention whether the micropipette has a hydrophilic or hydrophobic coating.

Gerisch et al. teaches coating a pipette tip with a hydrophobic material (abstract). It would have been obvious to one with ordinary skill in the art at the time the invention was made to coat a pipette tip with a hydrophobic material as taught by Gerisch et al. in the invention of Jones et al. Because as taught by Gerisch et al. tiny inaccuracies which could be relatively important when transferring small liquid volumes will be avoided.

Addressing claim 17, Jones et al. teaches a dielectric gate comprising  
an inlet fluid pathway;  
one or more electrodes in operative relation with the inlet fluid pathway;  
a hydrophobic patch adjacent at least one of the electrodes; and  
an outlet fluid pathway in operative relation with at least one of the electrodes;  
wherein the one or more electrodes are configured to draw fluid from the inlet fluid pathway to the outlet fluid pathway using dielectric forces arising from electrical signals applied to the one or more electrodes; and

wherein the hydrophobic patch is configured to inhibit fluid flow from the inlet fluid pathway to the outlet fluid pathway in the absence of the electrical signals. See the abstract and the section entitled "IV. NANOLITER DROPLET FORMATION, which begins on page 1445."

Note that a hydrophobic patch adjacent one of the electrodes "configured to inhibit fluid flow from the inlet fluid pathway to the outlet fluid pathway in the absence of electrical signals"

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is implied because “[w]hen the voltage is removed, the flow structure connecting the large droplet to the intermediate reservoir drains rapidly, leaving the isolated ~100 nl droplet shown in Fig. 7(c)” (second column on page 1445). Also note the water droplet as opposed to water film in Figure 5. ).

Jones et al. also teaches a micropipette in operative relation to the inlet fluid pathway for a period of time (Figure 6 (b)).

Jones et al. does not mention whether the micropipette has a hydrophilic or hydrophobic coating.

Gerisch et al. teaches coating a pipette tip with a hydrophobic material (abstract). It would have been obvious to one with ordinary skill in the art at the time the invention was made to coat a pipette tip with a hydrophobic material as taught by Gerisch et al. in the invention of Jones et al. Because as taught by Gerisch et al. tiny inaccuracies which could be relatively important when transferring small liquid volumes will be avoided.

***Allowable Subject Matter***

11. Claims 27-31 are allowed.

12. Claim 18 would be allowable if rewritten or amended to overcome the rejection under

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35 U.S.C. 112, second paragraph, set forth in this Office action.

13. Claims 4, 5, 12, 13, and 19-26 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

14. Claims 4, 5, and 12-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. The following is a statement of reasons for the indication of allowable subject matter:

a) Claim 4: the nonobvious improvement in the combination of limitations is the requirement that "the inlet fluid pathway comprises hydrophilic or hydrophobic surface coatings configured to provide preferential fluid flow directions." In Jones et al. the entire substrate is coated with the same material, such as polyimide;

b) Claim 5: the nonobvious improvement in the combination of limitations is the requirement that "the outlet fluid pathway comprises hydrophilic or hydrophobic surface coatings configured to provide preferential fluid flow directions." In Jones et al. the entire substrate is coated with the same material, such as polyimide;

- c) Claim 12: the nonobvious improvement in the combination of limitations is the requirement that “the inlet fluid pathway comprises hydrophilic or hydrophobic surface coatings defining a virtual channel, which provides preferential fluid flow directions.” In Jones et al. the surface coating is the same over the entire substrate;
- d) Claim 13: the nonobvious improvement in the combination of limitations is the requirement that “the outlet fluid pathway comprises hydrophilic or hydrophobic surface coatings defining a virtual channel, which provides preferential fluid flow directions.” In Jones et al. the surface coating is the same over the entire substrate;
- e) Claim 18: the nonobvious improvement in the combination of limitations is the requirement that a fluidic device be coupled to the outlet fluid pathway of the dielectric gate. Although Jones et al. discloses using a micropipette to dispense a droplet of sample to a reservoir coupled to the inlet fluid pathway (Figure 6), there is no suggestion or readily apparent way of coupling the micropipette (a fluidic device) to the fluid pathway, particularly at the outlet fluid pathway, as the micropipette is used to deliver a droplet having a volume of several milliliters to the reservoir, but only droplets on the order of several nanoliters are formed in the outlet fluid pathway (Figure 7); and
- f) Claims 19-26 depend from allowable claim 18;

g) Claim 27: the nonobvious improvement in the combination of limitations is the requirement of the step of “flowing the fluid from the outlet fluid pathway to a fluid device.” Although Jones et al. discloses using a micropipette to dispense a droplet of sample to a reservoir coupled to the inlet fluid pathway (Figure 6), there is no suggestion or readily apparent way of coupling the micropipette (a fluidic device) to the fluid pathway, particularly at the outlet fluid pathway, as the micropipette is used to deliver a droplet having a volume of several milliliters to the reservoir, but only droplets on the order of several nanoliters are formed in the outlet fluid pathway (Figure 7); and

h) Claims 28-31 depend from allowable claim 27.

### ***Final Rejection***

16. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

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CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alex Noguerola  
Primary Examiner  
AU 1753  
July 27, 2004